10. *Medical Statistics.*—Claude Bernard, in his *Introduction à l'Etude de la Médecine Expérimentale*, just published, gives us his views as to the value of statistics in medicine. The opinions of such a man on such a subject will interest most of us.

There are (he says) political, social, and medical theorists among whom statistics have a sort of mysterious veneration. Everything can be proved by statistics. It is a convenient way of getting rid of troublesome facts and of presenting hypotheses in an imposing form. Thus, when the number of pulsations are measured by an instrument throughout the day, and an average is taken of the varying numbers, "on aura précisément des nombres faux." The figures are exact, the average is an error, for it represents no actual condition. The pulse diminishes during the intervals of fasting, accelerates during digestion, and varies continually according to other influences, such as movement and repose; all these biological peculiarities disappear in the average. In like manner, when averages are struck from calculations respecting secretions, there is a mingling together of the most varying conditions; a secretion which is alkaline at one moment is acid at another; in the average it appears a compound of the two. When a physician collects a number of cases and from them draws up a description which represents the symptoms on an average, he describes that which never existed in nature.

This error of averages is strikingly exhibited in the various theories of food propounded by physiologists. The amount of oxygen, or any other substance, consumed by an animal in one day is estimated and compared with the weight of the animal; but the weight represents a total of various substances with which the oxygen has very various relations, some of them being totally unaltered by the oxygen, others profoundly affected by it. In like manner, a poison is estimated according to the amount required to kill an animal of a certain weight. "Il faudrait pour être plus exact calculer non par kilo du corps de l'animal pris en masse, mais par kilo du sang et de l'élément sur lequel agit le poison." But even then the mere weight tells us little. Other conditions interfere, and these, which vary with the age, size, sex, state of digestion, etc., of the animal, determine the effect of the poison.

Obviously, the first condition of statistical comparison must be that the facts compared are exactly observed and are capable of being reduced to unities comparable with each other. How often is this condition present in medical statistics? Every one familiar with hospitals knows what numerous causes of error have vitiated the reported "cases." Very often the diseases have been named at hazard after a superficial diagnosis; and even when the cases have been carefully examined, no two precisely resemble each other; age, sex, temperament, the complication of other diseases, and a crowd of circumstances interfere; and if this is so with two cases, how much more will it be with a hundred! The average is supposed to eliminate all these differences; but whenever the physician has a case before him, that case is individual, not an average; its peculiarities are not eliminated, yet on its peculiarities must depend the effect of his treatment.

M. Bernard reminds us that it is only when the cause is quite undetermined that any one thinks of applying statistics. No one enumerates cases in which oxygen and hydrogen compose water; no one counts the number of times in which division of a nerve paralyzes its muscles. It is only when the cause is unknown that cases are counted, and then the enumeration throws no light on the conditions. For example: some experiments showed that the anterior roots of the spinal nerves were insensible; other experiments showed that they were sensible; would it have thrown any light on this difficulty to say that the law of sensibility in the spinal roots is that of 25 per 100? Or ought we to invoke "la loi des grands nombres," and say that the roots are as often sensible as insensible? It would be absurd. There is obviously a reason why they are sensible, a reason why they are not, and it is these reasons we are to discover.

A great surgeon performs an operation many times; he then gives a tabular statement of the cases which have been fatal and the cases which have been successful, and statistically concludes that the mortality of this operation is two in five. What will this tell us respecting the certainty of the next case? We cannot know whether it will be one of the two or one of the three. We ought to know what are the conditions which will range it infallibly under one or the other head. Instead of an idle enumeration, we should make a fruitful study of each special case, and discover, if possible, the cause which renders the operation fatal. The same reasoning applies to curative remedies. A certain remedy has in twenty instances been followed by a cure; in seven instances no cure has been effected. You will say, perhaps, that there is twenty to seven in favour of success. Not in the least. You do not know how many of those twenty patients would have recovered had there been another remedy tried, or no remedy at all; you do not know what was the precise action of the remedy, what changes it effected in the organism, what its effects will be on the organism now about to be submitted to it. As a great mathematician observed, "La loi des grands nombres est toujours vraie en général et fausse en particulier." And as to the "compensations which bring about the law," they are useless in medicine. Mathematicians admit that if a red ball has come up fifty times in succession, that is no reason why the white should come up on the fifty-first; the white ball is certain to come up some time or other, but its appearance depends on specific conditions which have nothing to do with what has gone before.

Is there, then, no utility in statistics? M. Bernard is far from saying so. He admits that statistical results lead to probabilities and suggest research; but he protests against the idea that medicine must be only conjectural. He insists on the necessity for a scientific basis, and declares that every method of treatment which is not grounded on a clear recognition of the causal connections between agents and the organism is mere empiricism, not much removed from charlatanism. "Les médecins en général semblent croire qu'en médecin il y a des lois élastiques et indeterminées. Ce sont là des idées fausses qu'il faut faire disparaître si l'on veut fonder la médecine scientifique. La médecine, en tant que science, a nécessairement des lois qui sont précises et déterminées, qui, comme celles de toutes les sciences, dérivent du critérium expérimental."—*Brit. Medical Journal*, Dec. 16, 1866.

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11. *Morbid Anatomy and Early Physical Signs of Pneumonia.*—Dr. T. H. WATERS read (Dec. 12, 1865) a paper on this subject before the Royal Medical and Chirurgical Society.

He states that "although the conditions which characterize pneumonic inflammation—engorgement, red hepatization, and gray hepatization—have been accurately described by various pathologists, discrepancy of opinion exists on some points connected with the morbid anatomy of the disease, such as, 1st, the bloodvessels involved in the inflammation; 2d, the particular part of the pulmonary substance which is the seat of the disease. These points can only be cleared up by a careful comparison of the healthy with the pneumonic lung. With regard to the bloodvessels involved in pneumonia, the opinions of pathologists are divided. Some believe that the capillaries of the pulmonary artery are those essentially affected, those of the bronchial arteries being most probably also involved; some consider the bronchial capillaries mainly concerned; while others think it probable that both sets of vessels are simultaneously affected, although perhaps in different degrees. In considering this question it is necessary to examine into the arrangement of the bloodvessels of the lungs, to define clearly the parts to which each set is distributed, and to ascertain the exact portions of the pulmonary substance involved in the pneumonic inflammation. The true respiratory portion of the lungs consists of a series of air sacs situated at the extremity of each bronchial tube. These air-sacs are separated from each other by thin membranous walls. The pulmonary arteries are the only bloodvessels distributed to the air-sacs. These vessels ramify in the walls of the sacs, and form in them the pulmonary plexus. They are engaged not simply in carrying blood for the special function of the lungs, but also for the nourishment of the tissue to which they are distributed. Although the bronchial arteries pass along the bronchial tubes and supply the structures of those tubes and the areolar tissue of the lungs, they send no branches to the walls of the air-sacs,